RECORD

NO. 1 GEN

Electric Machinery Co.

1992 – S/N 353866
KVA - 4[illegible] VOLTS - [illegible] AMP - 102
KVA - 250, VOLTS - 480, AMP - 301

RPM - 109, P.F. .80

35 T Rise [illegible] - 3 Ph

AIR GAP – 1992 REBUILD – South .109, N. 106
E. .112 ; W. .109

LEFFEL

HEAD - 17', B.H.P. 460, RPM - 109

TYPE F, YEAR - 1938 SN [illegible] "W2074

5 7/8 apart FROM BACK (FLAT) OF THE BEARING CASE TO SHAFT.

1994 - 5 3/4 " E - W : 2 1/2 N - S : . . .

Jim Dean [illegible]

Gen. Belting – H.C. Ruggles – 19' 9"
Rein [illegible]

Oil levels - Sight to Brass 3 1/8"
Thrust { Brass => bearing [illegible] 1/2

Radial - 1 1/4 [illegible]

SLIP RING BRUSHES - EH - # 10-157-530-116-2-01

VERNON ROYAL

ACCOUNT BOOKS

160 PAGES · 9⅝ IN. x 6¼ IN.

AVAILABLE AS:		RULING:
NO. 4024-SEL	(64-6242)	S. E. LEDGER
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VERNON ROYAL, INC. Elizabeth, N J 07208 MADE IN U.S.A.

5/7/93 To 1/12-18/93 – Duration of the Rebuild on shaft before failure.

#1

21 Oct 77

Shaft and foot Bearing Sleeved Bolts - down for maint

28 NOV 77 took #1 gen off no speed control - need new gate pins, links and gate discs.

1 Feb 78 #1 turbine completed replaced 12 gate links - 12 gate pins and 12 gate pin Bolts replaced 6 discs cost parts $1856=

3 MAR 78 Replace governor drive Belt.

22 MAY 78 Replaced 3 ea Brushes cleaned rings

8 June 78 Replaced 1 link (gate) 2 ea gate installed new bearings (wood) replaced bearing babbit mat $6.00

6 Sept 78 adjusted foot Bearings

11/24/78 Oil leaks from Thrust Brg into shaft brg. running over full condition in upper shaft Brg - drained oil from shaft Brg to proper level, added oil to Thrust Brg NOTE = oil from Thrust Brg has brass particales in it, this is coming from the roller cage. ———

12/11/78 New lining on Brake

1/1/79 Shut unit down until can run check shaft Brg.

1/11/79 Chipped ice & dropped down. Found brg. & locks, very loose, adj & removed top door to for they freeze in. Did not have time to check gates due to door freezing in. Will have to readjust the brg approx. 10 days will check gates at that time.

1/18/79 We let #1 roll for about 1½ hrs & then put on line, run about 10 min & oil started running down the shaft on to the slip rings. Shut down & removed to cap.

over

friend by. Thrust bg. race over to one side about 1/4". Someone had layed a ring on the top shaft guard to hold the race in place. It didn't work. With the race off to one side it let the I.D. of the race put the oil retaining sleeve, in turn this let the oil drain from the thrust bg down into the shaft bearing section over filling it & letting oil run down the shaft. We will remove the thrust bg.

1/16/79 Draining oil & cleaning up.

1/17/79 Continued cleaning 2 hrs

1/24/79 Removed top shaft, nut, support plate & top bg. race, as indicated above the top 1/4" of the oil retaining sleeve had been broken away, this is strange & this is the fitting we are getting out of the lower bg. We do not have the thrust bg out but from all indications it seems OK.

1/25/79 Removed Thrust bg & clean parts & oil reservoir. Bg. is in pretty good shape,

over

Top thrust face ok, Lower thrust face is a little rough. debating whether or not to have it ground.

1/31/79 Received oil sleeve + upper thrust brg race retainer ring + installed, ready to check alignment on lower + mid brg. New brushes should be here Fri 2/2/79

2/1/79 Installed 1/16" shim on mid. brg. between housing + frame

2/2/79 New brushes will not arrive until 2/6/79, cleaned up brush holders (very dirty) cleaned + oiled insulators. installed old brushes + put unit on line.

2/7/79 Droped doors + tightened foot brg. Installed 1/16" shim behind mid brg. Looks like the center shaft is bent, We will try to straighten it in place later on. - Installed new brushes

3/9 Droped doors + timed to clean wheel - water to High. Adj Brg., left doors in to clean wheel when water drops.

79-80

4/18 Cleaned track out of wheel & pulled door
PLANT SHUT-DOWN 5/25/79
6/9 Replaced all door guides

B.H. Steen Const. Repaired hole in North Wall + installed two braces Tieing North East corner together. Beg grouted behind door guides. Installed two support columns in front of West door opening to support walk way. Repaired West end of walk way

9/10 Tighten foot Brg. + clean wheel

10/23 Replaced Broken gate

11/12 Tighten foot Brg.

1/24/80 Tighten foot Brg.

5/21 Tighten foot Brg.

7/9 " " "

7/16 Gen. will not stay on line, called G.E. possible bad oil Breaker.

7/21 G.E. checked oil breakers + found
22 east breaker badly burnt.
None of the three breakers were making contact on the main contacts, they lacked about 3/8" from making. The last breaker rod (WOOD - MAPLE) had to be replaced. NOTE - oil level from top of cam 11".
Put Gen on line at 10:30 AM
7/22/80

8/26 Tightened foot Brg.

10/15 Replaced Gov. Belt

10/31 Cleaned Gov. oil filter

11/11 East Contacts
Oil breaker that G.E. repaired has been heating up. Gene Hall came in + found contacts have been arcing, he removed + took back to shop to build up w/ silver solder.

11/12 G.E. brought in + installed contacts + lined up. put gen on line 12:45 P.M.

1981

2/6 Tightened Foot Brg.

2/25 Pulling bottom shaft

2/26 Took shaft to Raymac Mach. Shop to build up shaft W/ 316 S.S..
Bolt holes in top flange are much oversize, - started machining bolts in our shop.

3/20 Received shaft from Raymac - fitted flange bolts to holes. Installed shaft + turned turbine, ~~we~~ reduced shaft runout at Mid Brg. 50%. We still have about .100 runout.

3/27 Removed top shaft (21-6" long) + sent to Intercontenal Eng. K.C.K.S. for straightening

Shaft was bent .243" at the mid brg.. Straightened shaft to .012 runout.

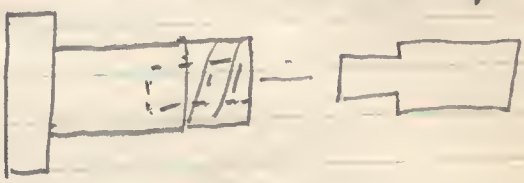
4/9 Brought shaft in + started assembling. - 683.09

4/13 Comp. installation of shaft + letting turbine idle. Shaft is running true W/ no visible runout.

7/6	Tighten foot Brg.
8/10	Tighten foot Brg. clean out trash.
8/24	Tighten foot Brg.
9/16/81	TIGHTEN FOOT BRG CLEAN TRASH
11/3	Grating collapsed at west end, approx. 7' section, Fab. pipe frame W/ fencing + covered opening.
12/30	Replaced Foot Brg housing bolts - Tightened brg. - 1982
2/24	Tightened foot Brg
3/24	Tighten foot Brg.
3/29	Replace Gov. Belt
4/26	Repair Load. Belt
5/3	Replaced Foot Bearing block W/ GAR-DUR Plastic

1982 1983

9/15 Found one gate link broken, Replaced W/new — Repaired Gate ring pin leg



1/13/83 Checked Foot Brg. — OK

3/7/83 Tightened foot Brg. — cleaned Wheel (Brg + shaft looks good.)

4/25 Tightened foot Brg.

4/26 Changed out main breaker coil W/ old one on roof of Power house.

5/13 Still having trouble W/ main breaker (Independent Elec. checked old coil-OK)

5/31 Tightened foot Brg.

6/23 Tighten foot Brg. — called G.E. To repair oil Breaker switch gear

6/24 G.E. cleaned contacts + linkage started unit 10:30 AM

7/25 Tighten foot brg.

1983
1984

8/1	Shut plant down & dewater
	Machine new control arm pin (south-east pin)
	cleaned Gov. oil filter
	Started Plant 11/13/83
1/26/84	adj foot brg & clean wheel
2/7/84	Replaced teflon on foot brg.
4/2/84	check #1 foot brg. OK, cleaned runner.
5/9/84	Tighten foot Brg. Lot of trash in runner
6/19	Tighten foot Brg. clean runner
7/9/84	New brake lining
7/17/84	Cleaned & Washed Wheel Cleaned Tower Deck
10/8/84	Installed 3 ea. Brushes
10/18/84	adj brg. - cleaned runner
11/5/84	adj Foot Bearing - Cleaned Wheel
11/16/84	New Foot Bearings

1984 - 1985

12/28/84 Replaced Gov. Belt.

1985

1/16/85 Replaced Gov. Belt (used)

1/18/85 checked foot Brg. cleaned runner

2/13/85 Tightened foot Brg

3/19/85 Tighten foot Brg.

4/16/85 Tighten foot Brg. clean

4/26/85 Replaced Gov. Belt (new)

5/8/85 Tighten foot Brg.

5/29/85 Cleaned wheel & took up foot Brg.

6/10/85 cleaned whel + adj Brg. Moved mid Brg west W/1/16 shim

6/18/85 adj Brg - cleaned runner

7/7/85 adj Brg.

7/31/85 adj Brg.

8/13/85 adj Foot Brg. Cleaned Runner

8/27/85 adj Foot Brg. Cleaned Runner

1985

9/10	Cleaned Runner & adj Foot Brg.
10/3	Cleaned Runner & adj Foot Brg.
10/8	adj foot Brg.
10/26/85	adj foot Brg.
12/16/85	adj Foot Brg.
12/23/85	adj Foot Brgs

1986

2/7/86	adj Foot Brg.
2/25/86	adj Foot Brg Cleaned Runner
3/25/86	adj Foot Brg Cleaned Runner
4/10/86	adj Brg.
5/7/86	adj Brg. Cleaned Runner
5/16/86	adj Foot Brg Cleaned Runner
5/22/86	adj Foot Brg Cleaned Runner
6/17/86	adj Foot Brg. Cleaned Runner
7/10/86	adj Foot Brg. Cleaned Runner
7/23/86	adj Foot Brg. Cleaned Runner
8/4/86	adj Foot Brg. " "

1986 - 1987

8/21/86 Cleaned Runner - adj' Foot Brg.

9/22/86 Cleaned Runner - adj' Foot Brg.

9/26/86 adj' foot Brg.

10/9/86 " " "

10/16/86 " " " Cleaned Runner

11/26/86 " " " Cleaned Runner

2/6/87 adj' foot Brg. - clean Runner, Thds. in bearing housing for Jack Bolt stripped out. Made up a threaded plate to fit inside of brg. compartment for Jack bolt. (North Bolt)

4/1/87 adj' Foot Brg

5/27/87 Cleaned Runner & adj' Foot Brg.

6/10/87 Started removing lower turbine shaft for repair - Intercontinental repairs Brg. area. Installed 6-26-87

7/1/87 adj' Foot Brg Checks Bearing Bolts

7/7/87 adj' Foot Brg. Put in ticker Spacer

8/10/87 adj' Foot Brg.

9/8/87 Cleaned Runner adj' Foot Brg.

9/9/87 adj' Foot Brg.

1988-89

10/15/87	adj Ft Brg Cleaned Runner & took up Bottom Bolts 12#
10/27/87	adj Ft Brg Cleaned Runner Check B. Bolts
11/9/87	adj Ft Brg East Side of bearing housing Broke out.
12/28/87	adj Ft Brg
1988	
2/29/88	adj Ft Brg put Spacers in Cleaned Runner
5/3/88	adj foot brg.
5/16/88	check Foot Brg.
8/18/88	Mem (3 ea) brg. blocks
8/24/88	Mem Gov. Belt
9/19/88	adj foot Brg.
12/13/88	adj foot Brg.
3/27/88	Pulled one gate to repair thds. in top of gate, will replace w/ S.S. Pin + shaft.
4-1-89	Adj. Foot Bridge.
6-4-89	Fix Gov. Belt,
6/5/89	adj foot Brg. 2 ea mem blocks

1989 –

7/31/89 adj foot Brg. Repair South Jack bolt

8/10/89 TIGHTEN HEX-HEAD GATE LINK PIN WHICH JAMED GOV. RING. PIN NOW BENT – LOCATION WOULD BE AT APROX 9 o'clock (WHEN FACING NORTH) AND UNDER GOV RING BRACKET WHEN GOV. IS WIDE OPEN.

9/28/89 ADJ Foot Brg – CLEANED TURBINE GATES CK. GOV. RING PIN.

10/31/89 adj foot Brg. TRIMED SOUTH BLOCK

12/13/89 adj foot Brg.

1990

1/10/90 Replace (2 ea) brushes

3/5/90 Adj't Ft Brg – replaced West Brg cleaned turbine

3/29/90 Adj't Ft Brg – CLEANED TURBINE New Gov. Belt

4/18/90 Adj't Ft Brg – check TURBINE

5/10/90 Replaced Hor. Trip pulley shaft.

1990

5/7/90 Lower shaft brg. area worn. Repairing shaft in place w/ceramic metal, (Belzona)

← Installed 3 ea. 1 1/4-7, helicoils for brg. housing.

= Pulled lower shafts after applying ceramic metal - took it in to be ground (at Union) Installed shaft; set bearing centers.

7/2/90 = Tightened lower bearings added threaded plate for West bearing screw.

7/9/90 T/G-7230 E. Block. - Block + Belzona ceramic showing wear grooves

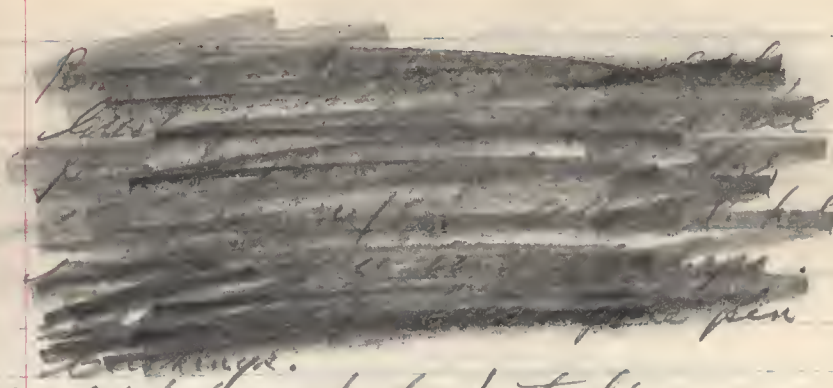
8/6/90 Adj Foot Bridge picksticks frm. Corner

8/20/90 Adj Fd Brg Shaft shows no wear

9/24/90 Adj Str Brg

10/1/90 11/10. Granite Co. started Wall repair & granite. Chiped out rotten concrete, Pined N-E corner w/ rebar on 9" Centers starting at floor & going above Water-line. Installed (4 ea) tie bolts. Granited W-N-E walls Completed 10/11/90

See sketch & Photos



11/6/90 Started overhaul of turbine
Removed all gates & pins
Removed lower gov. shaft

Union Machine Shop

1. Wicket Gates - Repair chipped areas, repair bushings. (6 gates)
2. Gate Shaft - repair connecting rod pin holes on rocker arm. Cut Gate Shaft in two pieces & flange together for sleeve assembly.

The gate Ring (Lower Plate) was grooved where the wicket gates had been riding. We sand blasted the ring & build up the worn areas w/ Chesterton #858 abrasion control putty & then painted it w/ #855 abrasion control liquid.

Replaced w/ S.S. = #13 Connecting Rod Pins, #9 Gate Bolts, #9 Gate Pins, #11 Gate Ring Pin

1990-91-92

Replaced w/ Bronze = #4 Slate Bolt Bushing, #6 Slate Washer.

12/21/90 Comp.

1991

5/3/91 Adj FT Brg.

6/14 " " "

6/17 REPLACED ALL FOUR FT. BRG.

7/27 GOV shaft not spin, tightened set screw

8/9 REPLACED SET SCREW ON GOV BELT SHAFT

1992

2/24/92 - REPLACED GOV BELT

3/5/92 - Adj Ft. Brg.

TEAR DOWN OF GEN. TOP.

8/3/92 - Removed top oil cover drained oil both top reservoirs.

8/4/92 - 8/6/92 - Removed top of gen. and raised stator for inspection

of stator coils + field coils by Hancock Elect.

8/12/92 Hancock Elect. ran electrical tests on stator + field coils - stator coil last rewound in 1948 ?45 - Field coils 1918 ? // 6 Field coils were shorted - the rest were marginal.

8/11/92 Began removing stator coils + cont. general clean up of other parts.

8/14 (Mon) Recieved new roller bearing from IBT #8250910

9/4/92 In Aug, sent thrust bearing + plates to Union Mach., K.C.Ks. for repair.

Recieved bearing + plates on 9/3/92

Thrust bearing refurbished w/ new rollers (54 in no.) from Elect. Mach.

Bottom thrust plate reground -

Top thrust plate reground -

Waiting on Hancock Elect. - Maybe should have gone w/ Southwest Elect for coil rebuild.

9/21/92 - Hancock Elect - 2 men - started installing stator coils - worked thru Friday (9/25) Took wk end off

9/28 - Hancock elect - 2 men - cont. work on stator coils + stator lamination Repair.

10/19/92 - 1st 20 Field Coils arrived from Hancock Attached same to rotor. Hancock tested stator coils + RT.

10/21 - 26 More field coils arrived form Hancock + were installed - 20 failed + were sent back

Approximately 40 field coils remain on rotor

10/24 Bill Gifford adjusted Polyphase meter back to 10:1. Determined that we would not be able to use 480 (400:5) current transformers - order them him 2 used 100:5 (20:1) transformers.

11/2-3 installed + connected current transformers - New (used) CTs 100:5 ratio:

11/5 Remaining field coils arrived + installed by Hancock -

11/6 Field coils torqued to 125 - 135 lbs - one field coil failed testing after being torqued; went back to Hancock w/ the work crew. All other field coils have passed these tests + have been soldered, taped + glipped.

11/7 - field coil returned, installed + tested K. Nugent

11/9 - stator replaced - air gap set. Top cover set in place

11/10 Placed roller bearing plate on gen. + installed brush holders

11/11/92 Installed bearings + bushings; removed shims, honored shaft; piping for oil reservoirs

11/12/92 Ac... [illegible], added oil to bearings - adjusted brushes, ready for Bro. Added plate to bottom side

11/13/92 phased-in + put gen on line, kw meter off by factor of about 2.5 less than actual. kilowatthour meter is off by about 375 ! (making it a times 37.5 rather than times 10!). Rescaled Ac Ammeter - it is now fairly Accurate. Checking Power factor causes reverse current relay to trip gen off line.

11-16-92

Final connections made, swapped connection to watthour meter, installed the KW meter dave fixed, it didnt work

11/21 wire up 3 fuses for OCC + PTs using fuse holder Low volt

12/2 Adds ft. Bridg.

12/2 changed secondary connections on west CT (they were backwards). made sure East CT + PT went to same location on watthour meter + same for west CT + PT. Watthour meter still off by about 2 times (times 20 rather than times 10). Reverse current relay does not trip when checking PF. PF very Low. AT 240kw PF was 0.73 Lagging with 1.13 ohms on DC rehostat. Increased resistance to 1.63 ohms and PF improved to 0.91. will need to add more resistance. Currently running at 1.13 ohms.

12/5 Noticed that PF meter uses common voltage from AC bus + that these PTs were on (using OK Johnson's color code when transmission lines were upgraded) white + red with blue as the common. CTs on bus are connected the same way.

(cont)

#1's CTs + PTs are connected to white + blue with red common. PF meter uses red CT for all other gen's. Since #1 is using blue as reference current, the PF is way off. Switch'ed red + blue connections at gen so that the sequence thru the OCB is (from East to west) white, blue, red. Switched the red + blue lines on power plant roof above #1. Sequence for transmission lines is (from east to west) white, red, blue. Now PF meter appears to be working.

X 12/6 Switched phase on SYNC scope to phase A (white) by moving connection from top of watthour meter to bottom PT connection of watthour meter. Now SYNC scope works as it should.

X 12/9 Replaced polyphase watthour meter with one that has CTs 20:1 ratio and PTs 20:1 ratio + is times 18.

12/21/92 GOV WOULDN'T CLOSE - BENT (OR KNOCKED) (stick?) ADJ FT BEARING - CK. WHEEL; NO VISIBLE SIGNS OF DAMAGE TO GATES; NO OBVIOUS REASON SEEN FOR GOV. STICKING.

12-30-92 - TRADED ft. brdg. plate, thick for thin on NORTH block. pick sticks = ADJ. FT. Brdg.

1/4/93 - ADJ FT BEARING CENTERED WHEEL.

1/18/93 ADJ FT BEARING - Belzona on shaft failed - probably a combination of severe bearing knock + the fact that the chamber ran dry because of ICE at the night of the 12th.

Put new blocks in + will run against the roughened S. Steel under surface.

* The shaft being exposed to below 32° temp + the addition of the impacts it received because of loose bearing - may have been a factor in the failure of the Belzona ceramic surface. NO WATER AT 28°, cold temp. NO factor

(correct) Swede thinks the heat of running dry caused shaft to expand + break.

BOTTOM 9 INCHES OF BLOCKS + BELZONA UNDAMAGE - THIS SECTION MUST HAVE BEEN STILL UNDER WATER WHICH SUPPORTS THE POSSIBILITY OF HEAT DAMAGE

1/21/93 CK FT BRG - CENTER WHEEL; IF ICE PERMITS WILL EITHER SPIN WHEEL OK Put IT BRIEFLY ON LINE + SEE IF THE BEARING WILL HOLD AGAINST THE DAMAGED SHAFT. - WHEEL SPUN - NO KNOCK Put UNIT ON LINE 9 AM - RAN IT up To 350 KW then gradually brought it back down to 210 KW left on line. CK DAILY STATION REPORT.

1/23 Installed New KW meter. It appears to be accurate.

1/27 INSTALLED + wired additional resistance to D.C. field lines.

2-3-93 Adj. ft. brdg picked 1 stick

2/22/93 ADJ FT Brg.

3/3/93 Adj ft Brg.

3/15/93 - Gov stuck opened. Dropped Doors in front of chamber why? need Wicket gates ck wicket gate + knuckles on Turbine Top plate.

3/26/93 - ADJ FT Brg, half turn on west bolt pitman Arm at ring.

4/1/93 added aprox 1/3 qt each to thrust bearing + the ball bearing of the QMI Hydraulic Oil treatment (eq. of Slick 50). will add more to roller bearing w/ the QMI comes in. Ordered from Napa.

4-9-93 Adj. ft. Brdg.
West ring bolt for pitman arm had unscrewed 2½" torqued down with socket & chekter - (5ft.)

4-21-93 Two link pins into doors were worked up to where they would rub top ring. Straight south pin would hit ring at 7½ on gov. 3 pins east, near east pitman, would hit ring at about 5 on gov. tourged both down. more later

4-22-93 Adj. ft. brdg threaded thick plate for thin east side, checked p..., All tight

1/27-28 - Gov. stuck on 7 - 7½ when attempted shut down for cleaning, dewatered chamber - believing that trash had jammed wicket gates. wrong.

Gov. Ring Pins were pulled after we found 4 pins dragging on top plate. One of the brass bushings that screws into the top plate for the wicket gates pins was binding on the wicket gate - it was trimmed and reinstalled. Governing still would not move. The problem was that the pinion arm plate had loosened and chopped apprx 3" putting governing in a bind. the second flange on the gov. shaft (put in 1990) had also loosened. Repositioned pinion arm plate tighted set screws in plate and flange - seems to have corrected the problem.

5/2-3 GOV STUCK AGAIN. Pinion Arm Plate slipped again.

5/4-5 Added straps w/ set screws below Pinion Arm Plate and replaced old set screws w/ new one. Fixed gov ring from the bind placed up on it when the pinion arm plate slipped - CK + Adj 7+ bearings.

5/6 Adj Equalizer Cam on #1 Gov - stopped chattering of relay valve + bounce out of Gov setting.

5/7 GOV stuck last night - went into turbine it this morning - repairs look good; pins O.K. - sticks must have into the wicket gate slots on the upper plate & prevented closure.

5/17/93 cleaned M.D bearing w/a the float

6/11/93 Gove stuck again at 5¼, only opened to 6¼ so never made the 7-7½ sticking position. dropped east big door only other way & gov. closed. dropped all doors left chamber dry for weekend.

6-14-15-93 checked channel across archway for vibration. none cleaned anti-seize from all set screws. tightened all set screws, nuts, bolts every connection on gov. shafts. Gov. still has shimmey in hydraulics but doesn't seem to transfer to gov. shafts, put on line as a test.
★ seemed stuck at 8 on gov. 15th evening but left running, worked fine morning of 16th, test continues

6-18 93 Adj ft brg Turbine looks fine test continues

6/23/93 TEST CONT. - ADJ FT BRG CONTROL wheel - NEXT TIME IN WILL NEED NEW BEARINGS TIGHTEN 4 NUTS ON GOV SHAFT (NOVEL FLANGE) + 2 SET SCREWS ON CRANK

6/28/93 ADDED FUSE TO D.C. + CIRCUIT ONGEN.

* 6/30/93 - Adj FT Brg. - Left off 2 hrs, KNOCKING CONTINUES - WENT BACK DOWN IN THE AFTERNOON: TAILWATER HAD LOWERED ENOUGH TO ALLOW FOR CENTERING RUNNER. COVER PLATES ON THE BEARING HOUSING HAD WORKED LOOSE, CENTERED RUNNER UNIT STILL KNOCKED, BEARING SURFACE WORN ON SHAFT WORN IN SUCH A WAY AS TO PRODUCE A CAM LIKE ACTION). UNIT WILL REMAIN OFF LINE UNTIL SHAFT CAN BE PULLED, BEARING SURFACE BUILT UP W/ S.S. Steel + then overlayed w/ 1/2 (apprx) layer of Belzona. - WAS ABLE TO KEEP UNIT SERVICABLE FOR 5½ mths AFTER INITAL FAILURE OF BELZONA BEARING SURFACE DUE TO HEAT FROM RUNNING DRY.

9/8-12 - HAVE SPENT THE LAST FEW DAYS DEWATERING + DE-MUDDING TURBINE CHAMBER IN PREPERATION TO PULLING LOWER TURBINE SHAFT FOR REPAIR.

REPAIRS: Possibly BUILDING SHAFT BACK UP TO REPLACE WORN METAL; THEN ADDING BELZOA TO THE BEARING SURFACE TO REPLACE THE BELZOA THAT WAS LOST WENT ICE CAUSED THE CHAMBER TO DEWATER WHILE GENERATOR WAS ON LINE.

10/13 – began the process of pulling the lower shaft.

10/14 – Removed lower shaft and loaded it on truck

10/15 – Took shaft to Union Mach. repair of worn bearing surface. area will need to be built up and tapered before Belzona can be applied for the new bearing surface.

10/25 – Received shaft from Union, began reinstallation.

10/26/93 – Finished installing shaft – put new bearing blocks in bearing.

11/2/93 adj ft brdg added Plates to all blocks.

12/30/93 – between 6 AM + 5:20 AM ZCC stuck; Reviews comments Took the gen off line but turbine chamber was at least partially dewatered, at 6:45 AM Top bearing plate was Almost exposed + surround by slushy

12/31/93 water. Discovered that Belzona bearing surface was only applied 1/4" thick (approx) on the dia. of shaft instead on 1/4" on the radius. material was slightly worn + heavily pock marked. Some pockmarks go all the way to the shaft exposing the metal underneath. Union Machine had trouble with air bubbles when they applied Belzona to the shaft.

1994

1/4/94 - Turbine was built back up w/ SS. according to Union Machine. Then undercut approx 1/8 of an inch then Belzona applied to almost 16" over the shaft dia. There should be plenty of Belzona on the shaft. we have apparently lost a couple of thousands of an inch of the bearing surface, just enough to expose the original cast bubbles before the skim coat was applied. Bearing blocks might wear a bit quicker than before.

1-5-94 Locknuts on two Jackscrews had backed off, Adj. brdg.

1-13-94 Adj. Ft. Brdg. Hedge seems to have quicker wear - maybe due to touchup and packed belezona.

1-23-94 Adj Ft Brdg. Belezona looks about like it did last time.

2-7-94 Adj Ft Brdg Centered wheel, Replaced two jack bolts w/ S.S.

2/21/94 Adj Ft brg - centered wheel - Replaced remaining Two jack bolts w/ S.S.

3/1/94 Adj Ft brdg. Switched E block with west block & new block in west
Centered wheel.
2 grn pin were loose - FAST pin on Ring
West pin on Shaft.

3/25/94 Adj Ft brdg. Centered wheel.

5/2/94 #1 o/l short in D.C. side

5/3/94 Rail Field Coil

5/4/94 found Two field coils w/ short to ground
removed same & sent to Hancock electric.

5/9/94 Coils came back from Hancock, reinstalled them
and put unit back on line.

5/10/94 Adj Ft brdg.. Centered wheel

5/17/94 Adj Ft brdg Centered wheel

5/19/94 Replaced Two Blocks centered wheel

5/23/94 Replaced other two blocks - trimmed 1st
two - centered wheel

5/27/94 - Trimmed other two new blocks ADJ Bearing

6/10/94. Adj brg centered/cl

6/15/94 Adj brg ch + centered wheel

6/30/94 Adj brg. centered wheel

7/11/94 Adj brg

8/1-5/94 - Gunited floor and repaired floor where it had separated from N. Wall of Turbine Chamber ~~added to~~

8/10-15/94 added two reinforcement bars w/ turnbuckles to lower N. wall for support. - need to make new trap door.

9/20/94 - Mod./cut trap door in place doesn't fit well on gunite flooring

9/20 - 10/5/94 - Washed gen stator + field coils replaced - used bearing oil in gen.

10/12/94 Cleaned gov filter.

10/24 Exposed bearing w/ #6 was put on line - shaft okay - tightened bearing centered wheel

95

11/27/94 – cleaned gov. dashpot filled w/ Mobil Mystery oil.

12/9/94 – Gifford changed the taps from 5 to 6 on the overcurrent relays – set to trip at 500 kW.

1995

2/28/95 Replaced Reverse current Relay adj gov. trip mech. so it would go to 0. Adj Reverse current to trip when watthour meter just starts to go backwards

3/22/95 Tighten bearing centerwheel

4/12/95 Replaced oil for ball bearing - oil visible in sight glass looked clean, however oil that was drained looked coffee colored. Replaced old oil with 1qt Dupont Teflon plus and approx 2qt 25-w Hydraulic oil. last oil change was 11/92 during rebuild didn't change Roller bearing oil. Mid bearing oil changed out in 9/94

4/17/95 - Ckd. roller bearing o.l - found brass chips in o.l - started draining o.l. ~~[illegible]~~ put dies in Instron chamber, tied open trap door.

4/18/95 - Jacked up shaft. - started tear down of roller bearing. Found: Rust in (alot) thrds of lg nut and shaft thrds. Conical pressure plate loose on shaft, due to rust - pitting - bore in pressure plate uneven, ridged & tapered. shaft shows pitting uneven dia. & slightly egg shaped.

Inner ~~race~~ retainer of pressure plate missing. It appears we are missing piece that fits under press plate and between upper thrust plate & shaft.

Outer retaining ring on ~~press~~ pressure plate was added 1/31/79.

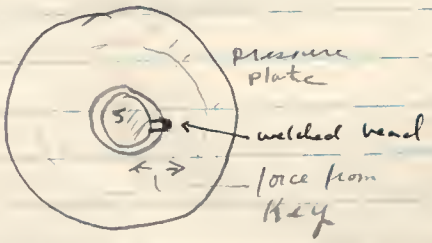
4/19/95 - Finished clean up of roller bearing parts - top & bottom thrust plate show some discoloration from roller bearings but no wear. Bottom brass plate & inner race of roller bearing shows some wear - nothing critical. ~~Dis~~ Drained ball bearing oil - oil was contaminated when upper bearing housing was cleaned. Removed valves and pipes in oil lines to these two bearings - need to replace & upgrade some components. Purchased (from I.B.T) and cut some S.S. shims for area between

shaft and upper pressure plate. Put roller bearing + upper thrust back in unit. Put pressure plate on to ck for play.

4/20/95

Put two S.S. shims 3"x12" & wrapped around shaft. Overlapped shims to meet keyway in shaft. Shims dia .003 +.005 was used. Used Permatex gasket compound + rubber bands to hold in place. Welded ½ (approx) beads along the length + down the middle of the shaft key - held it in place w/ rubber bands.

Reason for weld on key: on 4/14 - w/ pressure plate on + key in place - there was a lot of play in pressure plate. Part of this was due to wear in the keyways. The weld on the key would act as a shim.



Hammered pressure plate into place. Once in place - could find no play between shaft + pressure plate. Never used shaft threads & -threads in lock nut to prevent rusting. Put two new lock pins in pressure plate to prevent nut from coming loose.

Repaired oil lines. Filled ball bearing oil chamber w/ 1qt Dupont T. Plus and 2qts (approx) of 25 wt. Hydro oil

Filled roller bearing chamber w/ 1qt Dupont T. Plus, 2qts Dow Corning M gear oil additive and approx 14 gals of 80-90 wt. gear oil. Put top on generator + lower shaft.

Tightened FT brg. and re center wheel, closed trap dr and pull disc. out of Turbine chamber. Put unit on line ~~at~~ at 3pm. Everything running smooth.

4/25/95 - still has bearing rumble at 9 on BOV - drained oil in ball bearing - oil dark w/ debris - probably left over from clean done on the 19th - had a few brass chips + paint chips; probably from upper ~~[illegible]~~ oil chamber - filled w/ 25 DTE Hydro oil. will run unit for one hr. then drain - look at oil - decide weather to fill + flush again or not.

4/26 - after filling w/ Hydraulic oil + flushing w/ solvent on the 25th found metal chip in oil and solvent - ball bearing definitely damage. fill chamber w/ solvent and soaked overnight on the 25th.

Drained solvent on the morning of the 26th. Filled w/ Hydraulic oil - ran unit for 45 min - shut down, drained oil + flushed w/ solvent again.

Filled chamber w/ ¼ gt of Dow Corning M Gear oil additive, 1 gt of Dupont Teflon Plus + 80-90 wt gear oil - added unit for approx 1 hr. then put on line Took unit up to 9 on gov, head was 18 6 tail was 793 4, K.S. 11.8 - at C.S. 9 there is still a bearing growl or rumble but it is less than what it was before on the 25th (which was less than it had been previous when chamber was full with 25 wt hydrolical) however, previously the head was greater than 18 6. So, the condition may not really have improved. At the moment the unit seem to operate fine on a C.S. of 8.5 or lower.

At this time we are planning a shut down in June to replace the ball bearing.

5/11/95 - Replaced bearing Work centered shaft w/ tape measure - high water - couldn't clean summer.

6/5/95 - started tear down on #1, Removed thrust bearing

6/6/ - Removed upper oil Res. pulled tell bearing
- Removed mid. oil Res. started on lower (bottom) bearing oil res.

6/7/ - lower bottom Res. started took bottom bearing apart — Bottom bearing is a vertical Rotten bearing - Brg. damaged

6/8 - cleaned bottom bgs. housing
cleaned area in preparation to remove generator top - started digging - unhooked and marked wires - measured everything

6/9 - Removed GEN. TOP - HUNG IT OVER #2, Removed Slip RINGS removed INSULATION FROM FIELD coil CONNECTION - Removed BOTTOM STATOR BOLTS, REPLACED w/ 5 guide pins HUNG HOISTS TO ~~REMOVE~~ LIFT STATOR - RAISED STATOR - BENT TORCH TIP TO ALLOW FOR TORCHING THE FIELD COIL CONNECTIONS FROM THE BOTTOM OF THE SOLDER JOINT. ORDERED BOTTOM ROLLER BEARING FROM IBT. (If THEY CAN FIND ONE).

6/12 - Raised stator - started removing field coils. - finished w/ field coils by 3pm

6/13 Lowered stator back onto gen. base. Removed flange bolts - loosened large lock collar. Started raising rotor and shaft - raised shaft enough to remove large collar. Rigging - 5 Ton on South side of rotor + 4 Ton on North side.

Photos

~~Rerigging w/ 4 ton over center of shaft.~~

Set blocks w/ oak boards under rotor.
- Rerigging w/ 4 ton over center of shaft.
- raised rotor + shaft and shifted them over across oak boards until shaft was directly under 4 ton hoist.

6/14/95

Pulled rotor and shaft from gen. and set on floor. Had to raise and rerigg in stages see photos One A+B:

- Green hoist (4 ton) over shaft, clevis on hook, two chains then clevis attached to rotor 180° apart.
- 1st Orange hoist (2 ton) hung from beam midway between gen. units #1 + #2 attach to edge of Rotor 90° away from other chains -
- 2nd Orange Hoist hung from clevis on 4 ton hook and attached to rotor 180° from other orange hoist hook up.

- Ropes pully (not shown in photos one A+B) tied to ~~gen~~ green hoists trolley and unit #2.

Two A - raised green hoist and then began raising 2nd orange hoists - keep chain tight on 1st orange hoists and ~~used~~ used rope pully to pull rotor from gen.
- lower ends of shaft next to stator coils stopped and rerigging orange hoists.

Three A-C - hooked 1st Orange hoists to rotor were 2nd orange hoists was hooked - hook ~~on~~ 2nd orange hoists to bottom of flanges.
- raised 2nd hoist until end of shaft cleared stator while pulling on rope pullys to 1st. orange hoist

June 14/95 –

to remove rotor and shaft away stator.
- lowered rotor + shaft to floor between units #1 + #2.

June 15 - took bottom roller bearing to Pete in Wis. and pick up 100 Ton press.

6/19 - Manufactured front wheels + handle for 100 Ton press - Pete Bruno claims that bottom roller bearing (even though it shows wear) is ok. to re use. I still would prefer to find a new one
- need to add separate drain holes to bottom and middle bearing

6/20-21 - tryed different ways to ~~rigging~~ rigg press

6/21 - had press rigged w/ stays and chain put 50 Tons on rotor - rotor didn't move. Pete claims the rotor is a light press - no need to heat rotor (ya right.)
- afraid we would brake chains, tore down set and rerigged w/ stirrups on stays and oak on rotor rim went up to 60 Tons - no luck.

6/22 - added more oak to rim went to 60 tons + heated front + back of rotor w/ two Rosebud rigs shaft came loose.

Photos →

12/6-8/95 — uninstalled field coils + chopped
Tested them

12/12-15/95 taped and glipped field coils
"

6/22/95
- removed shaft - loaded onto truck - to take to Union Mach for them to press off roller bearing hubs, since we have nothing to press it off with without damaging it's machined surface

6/23/95 will load upper thrust collar onto truck w/ shaft and take both up to Pete for re-forging on Monday the 26th.

11/13/95 changed dial face on ploy watt phase meter. Hopefully it's X10 now.

Making log
when shaft returned from Wis only 2 men working on #1 stopped work on one to tear down 5 + 6 everyone else was working on Dam. O.B. FB, etc

12/18-22/95 wrapped shaft w/ 10000 volt kevlar tape - covered tape w/ 5.5.5 insulation and 10 000 volt tape. put fiberglass tape over exposed kevlar tape. glipped stator surfaces and top surfaces where they will join together in hopes of insulating them from each other.

* Moved Top (sec. w/ Brush holders) and place on stator - will need to remove it slightly to regrip the surfaces.

12/26/95 cleaned wheel & checked clearence of runner with turbine. Top is on.

12/27/95 Installed Brushes & holders. Clipped Tape on shaft at slip rings. Put on Ball Bearing oil res.

1996

1/8-9/96 Put ball bearing oil res. on, heated ball bearing holder & slipped it onto shaft. holding ball bearing up with special holders made for this purpose. Put roller bearing oil Res. on & thrust plates & roller bearing. Checked shaft height with upper thrust plate. will have upper thrust plate machined at Union

1/10-17/96 Union machined upper thrust plate & made 6 Grade-8 3/4" NF x 8" Long, threaded All the way up Shaft, bolts.

1/17-24/96 measured clearence for Spacer between upper thrust Plate & sleave above ball bearing. Began to machine Cap that holds everything up. Also worked on oil res. plumbing.

1/30/96 added Approx 15 qts (13 qts gear oil, 1/2 qt of teflon, 1 qt of moly gear additive) of oil to bottom roller bearing.

used 90 wt gear oil in all res. . top res. →
- put 2 1/2 qt moly + 1 1/2 te/lon plus w/ gear oil.
- put 1/2 qt moly + 1/2 te/lon plus w/ gear oil
  in middle (ball bearing) res.
- put 1 qt moly 1/2 qt te/lon plus and gear
  13 1/2 qts gear oil in bottom roller bearing.

2/1/96 – ckd air ; tighten Ft bearing.
pulled doors. Air gap between ~~stator~~ stator and Rotor is : E - 0.100, W - 0.122, N - 0.119, S - 0.122 measured from bottom with shaft hanging on bearings.

2/2/96 – put dust cover on – not in spinning
– will have to rework some of the brush holders before we put it on line.

2/5/96 – #1 on line at 1:30pm. Upper oil res. might be a bit full – oil on slip rings might also have one Ft brg. block loose.
– filled oil res. in also sub zero weather
– adj Ft bearing in subzero weather

2/6/96 – tightened Ft brg. cleaned sl. rings put on line at 9:30 am.

2/6/96 – 11:30pm sounds as though there is a steady knock coming from the upper roller bearing – is 90 wt gear oil too thick in cooler temps – oil temp gauge reads about 92° F.
– knock is coming from down below almost disappears after greasing mid brg bearing
– either it is something in the mid brg bearing – ~~bearing~~ babbit out of round + the shaft hanging straight is catching on it or it a problem down ~~on~~ in the turbine

'96

2/6/96 - Burned up oil circuit breaker closing coil.

2/7/96 - Replaced closing coil w/ spare - covered leads of closing coil & trip coil w/ Heat shrink insulation - old insulation was badly cracked & broken. reached oil piping (drain line) to ball bearing, found slight leak in pill line at the elbow connecting ~~to~~ to the oil reservoir. Coated the elbow w/ gasket compound. Put unit on line @ 1:45 pm

2/9/96 Tightened Brg. trimming ALL Blocks & centered wheel, checked g.v Arm pins & Set screws, all tight.

2/12/96 tightened Brg. replaced South Block add shim to E & N Blocks. Checked all Link pins & tightened those that were loose.

2/14/96 - Tightened Ft. Brging. & centered wheel by measurement.

2/23/96 - tightened Ft. Brging

3/11/96 - tightened ft Brging.

[Red]

3/25/96 - lost one phase ↑ (unit tripped during the night) due to wind breaking a feeder line @ the roof top fuse/switch. Called Independent Electric to meg stator + O.C.B. Line I on roof] fell away when fuse was pulled. This was the problem but since Independent Elect was already here; we had them meg the stator + O.C.B. -

- Stator megged @ 5000 meg. ohms
- O.C.B - Red phase @ .652 mi. ohms across contacts.
  Blue phase @ .56 mi. ohms
  White phase @ .372 mi. ohms
- Normal resistence on O.C.B. phase should be .2 mi. ohms
- will need to clean contacts + change oil in O.C.B. soon.
- unit back on line @ 2pm — stator buzzes as usual.

4/30/96 — tightened bearing + centered wheel.

5/1/96 Water sensor is set to trip at a River Stage of 8.8 or slightly above.

5/20/96 tightened Bearing + centered wheel
Runner blades approx 3/8" thick.
3 blades bent (by stick?) where cutouts were made for wicket gates.

'96

5/24/96 centered wheel & Replace S & E block & tighten ft. brg. Water has been high & full of silt. this past 2 weeks.

5/30/96 cleaned wheel & tighten ft. brg centering wheel using measurements. River still very dirty & silty.

6/12/96 - Tightened bearing.

6/13/96 - Tightened bearing & Trimed South block, ck wheel.

6/17/96 - Replaced bearing blocks - centered wheel by measurments. Water was over the walks (door were already in place) tail was 802; water almost (4" apox) @ turbine top.

6/18/96 CENTERED WHEEL & TIGHTENED BRG.

6/20/96 Tightened bearing spun wheel did not put on line

6/25/96 Tightened bearing & centered wheel

6/27/ Tightened bearing Center Wheel by measurement, cked wheel.

6/29/96 Rotated block, centered measurement tightened, ckd wheel

7/8/96 Replaced 4 blocks + sanded Puck. marks on belzona material, Centered wheel.

7/12/96 - hot runner hooked side clearance runner appears to be fairly centered Put Bearing blocks in and tightened them w/out centering wheel - We will see if 1.) the runner doesn't hit as it rotates, either wicket gates or turbine sides. 2) To see if the blocks will stay tight + not wear loose. put unit on line @ 3130pm will take off line @ 4pm - unit off line @ 11pm

7/15/96 - Idled unit over wkend - start unit up @ 7pm - was developing a knock took unit off line @ 7:20pm Dewatered chamber - began attempts to remove side jack bolts - jack bolts + NUTS are S.S. steel.

Finished removing side jack bolts - will replace w/ S.S.
Spray painted Belzona coating on shaft. - tightened bearing + put unit on line.

7/18/96 Checked wheel, rotated bearing blocks, centered wheel tightened bearings.

7/28/96 Hung draft, cleaned wheel tightened bearings
Checked gov arm bolts

7(

8/27/96 - Tightened bearing put in new side jack bolts = didn't ck wheel

10/3/96 - Install GOV shut down solenoid.

10/4/96 - Wired GOV SHUT DOWN SOLENOID to oil current breakers.

10/22/96 tightened ft Brg. & Checked wheel

10/30/96 - Tripped again @ 3:30 am manually level sensor was blocked by leaves or dirty water.

11/1/96 Tightened Brg. cleaned wheel changed ~~N+S~~ Blocks with ~~E+W~~. Replaced E+W Blocks with New. Cleaned water Sensor - had Rock between prongs.

11/4/96 tightened ft Brg.

11/11/96 – w/ a R.S. of 10' G.S. on #1 was opened from 8 to 10 (9½ on scale) W/ a screwdriver - could hear a light hit or impact from the turbine but couldn't change the G.S. – screen we would have to go into the bearing soon – Head was 17'.6".

11/13/96 – R.S. 9' @ 7am G.S. wide open. bearing smooth – apx at 10:30am R.S. must have dropped below 9', for about 5 sec. turbine had a strange thump then the water level sensor kicked in and shut the unit down Went into the unit and this is what was found:

1.) Bearing blocks were loose, as far as we know the bearing was ~~smooth~~ running smooth up until the time of shut down.

2.) Babbitt on shaft shows some wear – don't know if it was caused by this or the heavy silt that's been in the sumps.

3). There was minor damage to the runner from hitting the wicket gates. Every runner showed recent flaking of light metal ~~on~~ underneath and ~~on~~ inside corner @ the bottom of the runner

vanes show bright metal from wear
Prior to the rebuilt the turbine was
never opened over G.S. 9 because the
runner would hit on the wicket gates.
But that was when the runner was
being centered from brace plate. Now
we let the runner hang then tighten
the bearing blocks it may now hit
the wicket gate b/w G.S. 9 and
above G.S. 8.

4.) w/ R.S. of 9' there was about
a foot drop in water level between
G.S. 9 and G.S. 6. Between G.S. 6
and G.S. 3 there was @ most 1"
drop in water level, there is turbulence
in the water but no white water.
The turbulence becomes noticable
between G.S. 4 + G.S. 5. In
addition the ~~the~~ level drop @ G.S. 9
there has to be @ least 10x's the
turblence than @ G.S. 6, as well as
a lot of white water.

Put unit on line set the G.S. @ 6
w/ an R.S. of 9'.

1/6/97 adj ft bearing trimmed 2 blocks & replaced 1 block. Cleaned wheel.

1/15/97 - tightened bearing - had to turn South block Cwidth wasn't trimmed before installation ? adjusted several side plates.

1/30/97 - tightened bearing - trimmed S+W block, hung shaft, cleaned wheel.

2/3/97 CHECKED WHEEL - CLEAN, TRIMMED TWO BLOCKS S+W, CHECKED CROSSOVER - SAME, HUNG SHAFT, ADDED PLATE IN S BLOCK, TIGHTENED BEARING

2/27/97 - cleaned wheel tightened bearing - told it will probably need 2 new blocks may turn down.

3/3/97 Changed tap settings on over current Relay from 6 to 5 - this makes it 410kW max verses 492 kw max. This unit is 400 kw max under cool ambient air temp + 350 max when its Hot.

3/3/97 - Gov has been acting up (on some runs) if possible, need to try + repair gov.

3/24/97.. checked wheel, replaced south & west blocks, hung shaft, tightened bearing

3/31/97 – checked wheel, hung shaft
tightened block
– gate shimmed actuating
lever.

4/16/97 checked wheel, hung shaft, trimmed
blocks, tightened bearings

5/6/97 Replaced 2 blocks (south + EAST)
Checked wheel, hung shaft,
tightened bearings

5/7/97 Replaced closing coil with
one Rewound in 1996.

5/8/97 ~~Replaced~~ ~~Tightened~~ 2 blocks (south + west) loose
Hung shaft, trimmed all 4 blocks
Tightened all bearings

5/13/97 tightened bearing + checked wheel.

5/27/97 checked wheel, hung shaft, tightened blocks SPW

6/6/97 Replaced West Block; Hung shaft, tightened blocks.

6/9/97 WEST BLOCK LOOSE, HUNG, TIGHTENED

6/19/97 SOUTH BLOCK, TRIM, HUNG, TIGHTENED CLEANED WHEEL

7/2/97 Replaced SOUTH and WEST Blocks with green nylon blocks; added angle iron to same. HUNG, TIGHTENED, CLEARED WHEEL
SOUTH MEASUREMENT - 4 1/4" from face of Chesterton to Back Wall OF BLOCK

8/4/97 Replaced NORTH and EAST blocks with green nylon blocks; HUNG, TIGHTENED, CLEARED WHEEL

9/5/97 megged D.C Lines. Found Low Value from slip rings to Field poles. Line to Rotor - 3GΩ.; Rheostat - 300MΩ. Did not isolate where Low Value actually is other than it's at the generator. Test was - 500V; 5 MIN; @ 70°F and 63% RH.

4/15/98 Hung shaft, tightened blocks, cleared wheel NORTH and West blocks loose

11/7/97 Cleaned wheel, hung shaft and tightened bearing. Blocks and belzona looks very good. If anything, belzona is wearing slightly.

12/16/97 #1 made game attempt to act as lumber mill. Cleared wheel, hung shaft, tightened foot bearing. EAST block slightly loose. LOWER TURNBUCKLE on EAST side needs tightening.

1/13/98 SOUTH block loose. Tightened bearing. Hung shaft. Very cold. Water guage may be inoperative.

2/19/98 SOUTH BLOCK GAP, PULLED SAME CHECKED BEARING SURFACE ON SHAFT GOOD WYE BLOCKS CUT GROOVE IN STAINLESS ABOVE ~~BELZONA/CHESTERTON~~ / NEXT TIME IN CUT TOPS OFF WYE BLOCKS

3/3/98 Mysterious thump. No blockage or loose blocks. Hung shaft anyway. DID NOT SHAVE BLOCKS. Thump went away.

4/10/98 CLOCKED, HUNG, CLEANED GROOVE STILL PRESENT SOUTH BLOCK MIGHT BE WEARING?

4/15/94 - Checked wheel -- ok, Removed blocks; grove above belzona material -- trimmed N, E+W blocks so that they now Ride only on belzona material. South block appears to be slowly wearing. Tightened blocks after swinging shaft. Unit put on line and is Running smooth.

4/29/94 Check wheel -- ok, hung shaft + tightened bearing. South block is wearing.

5/12/98 Ran transmission lines over roof and connected it into mains above bus bar on power plant roof. Will take down old bare transmission lines and fuse holders.

6/24/98 checked, centred, cleaned, rung shaft & runner. Swathed South + north nylon block had to shim north block. Possible turbine cant N → S will check next time. Trimmed N block height to avoid the groove above belzone coating

7/6/98 BEARING WORK S-BLOCK LOOSE WHEEL LOOKED FINE / CENTERED TIGHTENED

7/24/98 SOUTH and EAST blocks loose. Cleared wheel, tightened bearing. High water since last bearing tightening.

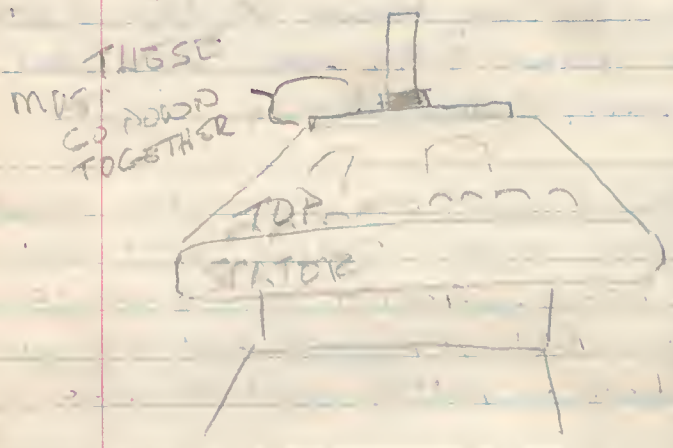
8/4/98 NORTH block worn; touching SOUTH and EAST blocks. Trimmed NORTH block, cleared wheel, hung shaft, tightened bearing.

9/2/98 Stator shorted to generator on SE side near O.C.B. Megged unit and found Arcing. Spraying on clear glip and then Red grip. Will Let Dry over night before putting unit in place.

9/3/98 unit Still Shorting. I E will check units on Tuesday 9/8/98

9/8/98 I. E found 3 connections melted. Cause - Running unit over Rating. Unit will be Rated at no more than 300 KVA.

9/22/98 Began Removing top. Removed top Plate Roller bearing. To Remove bottom thrust plate used 10 BWG wire thru holes in middle sleeve and hoist to ~~broke~~ break oil seal - note: bottom guide plate that is tapered may Come also, only thing holding these two plates together is a thin film of oil. Removed top oil Reservoir. Removed guide bearing by heating it up. Removed Lower Roller (guide) bearing.



PS, SEE PHOTO

9/29/98 Independant electric fix 3 melted leads near O.C.B. on Stator.

9/30/98 Cleaned Stator + Rotor with Solvent left by Southwest. Cleaned inside of Gen. ~~Put~~ + sprayed Insulating paint on top of stator where connection leads are. Put top back on.

*11/93 DISCOVERED ROLLER BEARING & SHAFT GUIDE SLEEVE MUST GO ON AT SAME TIME (SEE DIAGRAM) NUT ROLLER BEARING WHILE SETTING INSIDE GUIDE SLEEVE THEN SET DOWN. HAD TO MOVE SHAFT TO SOUTH FOR BEARING/SLEEVE TO SEAT COMPLETELY. Installed Roller bearing oil Res. Base oil Retaining sleeve, tapered plate, thrust plate, Roller bearing, top thrust plate, + top tapered plate + key. Installed top ~~+ bolted it down.~~ of Shaft + bolted it down. Installed brush holders, oil lines + filled with gear oil. Changed oil in middle guide bearing under Rotor. Note: After installing Guide sleeve + ball bearing + oil Res - it might be a good time to add oil, otherwise it takes a Long time to Spun unit.

10/2/98 Unit on Line.

10/13/98 Tightened Bearing. Painted Unit Outside.

10/14/98 Painted inside of Gear

11/18/98 Cleaned wheel tightened bearing, Unable to move shaft

11/19/98 trimmed East block, tightened bearing after Centering Shaft.

12/10/98 cleaned wheel — Found Big stick. checked Brg.

12/11/98 THUMP! NOTHING TO SHOW
HUNG SHAFT, CHECKED WHEEL,
HAND TIGHTENED JACK BOLTS,
WEDGED LOCK NUTS
SPINNING — NO THUMP?

3/4/99 Steady hammering, "I Style. Cleared wheel, checked bearing, hung shaft. Blocks may have worked loose from top to bottom: E and W blocks showed mud on center of rounded face. N block pinched on west Side. "slag" Knocked off.

5/11/99 Tightened foot bearing, hung shaft. Noticed Belzona has broken 1/4" from top. Trimmed blocks to run only on Belzona surface

5/13/99 Removed Lower Shaft and took it to Union Machine to be built back up with stainless steel.

5/20/99 Picked shaft up from Union.

5/21/99 ~~Be~~ Installed Lower Shaft. Runner was sitting on curb ring and was not chained up. Missing bolt was to West on Runner.

5/24/99 Changed oil in O.C.B.

5/17/99 Replaced knife switch with 100A Breaker

6/4/99 Tightened Ft. bearing.

6/7/99 Tightened Ft. bearing. North block loose

8/25/99 East block loose hung tightened
* east pack jack bolt broken through on foot bearing — mechanicly the jack bolt still functions, screw plates in place and secure

11/18/99 Replace gov. Belt

12/15/99 Unit had problems going on-line. RPM increased as governor setting increased + AC Ammeter went from 60A to over 100A. Megged rotor + discovered shorted pole pieces. Split rotor + discovered both halves shorted. In all maybe 8 pole pieces good.

12/16/99 Removed pole pieces + delivered them to INdependent Electric. Megged stator at 50 Gohm at 1 minute + 175 Gohm at 10 minutes. P.I. = $\frac{175}{50}$ = 3.5 a very good number.

End of written records. See Maintenance.dbf for 2000 + beyond as well as these ~~entries~~ entries. This is a Microsoft Access database.

MAJOR REPAIR INDEX

1990 TURBINE REHAB., SHAFT [illegible] & FAIL
GUIDE VANES REHAB, CHAMBER REHAB.

1992 GEN REWIND - UPGRADED
FROM 480 TO 2300
8/3/92 TO
STATOR REWIND FINISHED by 9/25 (9/28?)
TESTED ON
ATTEMPT TO RECONDITION + UPGRADE 480 FIELD COILS
TO 2300/3500 KVA FAILED - EDGE WOUND
changed to FLAT WOUND

WORK DONE BY HANCOCK ELEC.

10/19 - ATTACHED 1st 20 FIELD COILS, STATOR TEST
10/22 - UNABLE TO USE 480 (400-5) CURRENT TRANSFORMERS
ORDER 100-5 (20:1) TRANSFORMERS (USED) THRU
GIFFORD, GIFFORD RECALIBRATED POLYWATT TESTER
BACK TO 10:1 RATIO (CHANGE OVER FROM 480 to 2300
MADE IT 50:1) 20+ FIELD COILS SENT BACK TO
HANCOCK ON 10/26/92 - AWAITING THEIR RETURN.
10/5 - FIELD COILS ARRIVED - WERE INSTALL BY HANCOCK
11/6 - #22 FIELD COIL - ORGINAL (1st) BATCH - COIL
FAILED AFTER TORQUEING - WENT BACK WITH
HANCOCK CREW.
11/7 - REBUILT COIL RETURNED + INSTALLED
+ TESTED
11/7 - STATOR + TOP COVER REPLACED AIRGAP SET.
11/10 - ASSEMBLY CONT'D.
11/12 ASSEMBLY COMP'D.

10/25/93 - Removed shaft w/ new Babbitt bearing
surface - Pulled shaft and took into Union Mach. on
the 15th Oct. We were on shaft mount on
account of [illegible]ga Jan/93 damage build up
w/SS. Shaft ck'd & turned down new Babbitt applied
shaft should be re-mounted by 10/26/93.

June 1995

Tore down gen. to remove bearings and replace shaft in gen.

2/5/96 #1 back on line

Swedes safe combo: 4 left to 20 ; 2 Right to 49
1 left to 76 ; Right till stop

846.4077
364

TRUST BEARING OIL CHANGES.

11/92 all bearings

* 3/93 – no oil change but added Qmi

9/94 – Mid bearing oil changed

4/12/95 – Ball bearing oil changed w/ 1qt Dupont Teflon Plus + 2qt 25w Hydraulic oil.

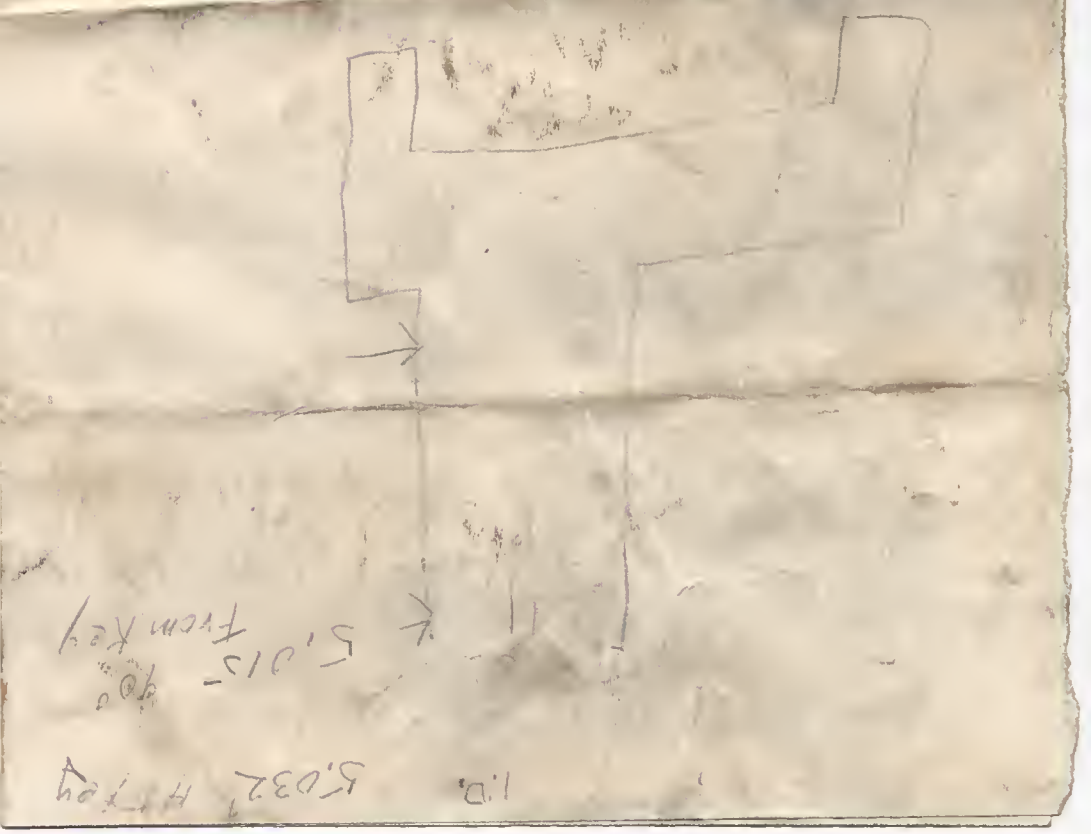
Trip Coil - 324161 - 03

Closing Coil - 324160 - 03

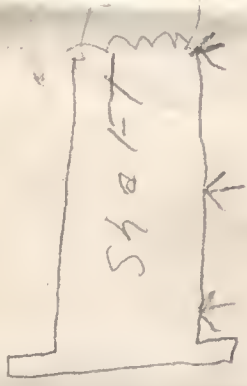
Basin Lip to Brass $3\frac{1}{8}$"

Brass to Bearing Sleeve $1\frac{3}{8}$"

Radial Brdg
$1\frac{1}{4}$



5.011 N to S
5.010 E to W
5.010 E to W
5.011
5.004 N to S
5.005 E to W



5.011 N to S 90°
5.010 E to W
5.010 E to W
5.011 N to S
5.004 N to S
5.005 E to W

Set Inside Mikes

Inside Mikes
5.019 = 5.010 outside Mikes

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Ubuntu is an operating system consisting of free and open source software. With Ubuntu you can surf the web, read email, create documents, spreadsheets and more! Ubuntu gives you power and flexibility for business, education and home use.

Ubuntu is easy to install, free of viruses, and perfect for laptops, desktops and servers. The CD inside will install in a dozen languages; many more languages are available via download. Ubuntu is community developed, commercially supported, and offers free updates for at least 18 months after release.

"Ubuntu" is an ancient African word that means "humanity to others". This Linux distribution brings the spirit of Ubuntu to the software world.

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This PC Edition will run on Intel x86-based systems (including Intel Pentium, Intel Core and AMD Athlon).

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Ubuntu 7.04 for your PC

Use Ubuntu

To use Ubuntu as a Live CD, put this CD in the CD drive and turn on or restart your computer.
To install Ubuntu, run the Live CD and double click on the "Install" icon. The default installation will erase all existing software and data from your computer. If this is not what you want, follow the instructions carefully during installation.

To try Windows versions of some of the programs included in Ubuntu, put the CD in the drive while Windows is running.

The Ubuntu Promise

- Ubuntu will always be free of charge, including enterprise releases and security updates.
- Ubuntu comes with full commercial support from Canonical and hundreds of companies around the world.
- Ubuntu includes the very best translations and accessibility infrastructure that the free software community has to offer.
- Ubuntu CDs contain only free software applications; we encourage you to use free and open source software, improve it and pass it on.

The Ubuntu Community

The Ubuntu community is what makes Ubuntu special, and we invite you to participate in it too! Visit www.ubuntu.com/community to learn how.

System Requirements

To use the Live CD, you must have a PC with at least 256 MB of RAM. To install Ubuntu, you should have at least 4 GB of disk space.

Pass it on!

This CD can be used to install Ubuntu on an unlimited number of PCs, desktops and laptops. So install it, enjoy it, and pass it on to your family, friends and colleagues!

GNUmedia Society

Medios Libres

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